

Table S1. Parameter values used in agent-based simulations.

Fixed Parameters			
Name	Definition	Value	References and Explanations
ϵ_0	Eq (S2)	6	Shimizu <i>et al.</i> 2010 [1]
ϵ_1	Eq (S2)	-1	Shimizu <i>et al.</i> 2010 [1]
N^{Rec}	Eq (S3)	6	Shimizu <i>et al.</i> 2010 [1]
K_i	Eq (S3)	0.0182 mM	Shimizu <i>et al.</i> 2010 [1]
K_a	Eq (S3)	3 mM	Shimizu <i>et al.</i> 2010 [1]
α	$Y = \alpha a$	6	Sneddon <i>et al.</i> 2012 [2]
K	Eq (S5)	3.06 mM	Sneddon <i>et al.</i> 2012 [2]
ϵ_2	Eq (S5)	40	Sneddon <i>et al.</i> 2012 [2]
ϵ_3	Eq (S5)	40	Sneddon <i>et al.</i> 2012 [2]
ω	Eq (S5)	1.3 s ⁻¹	Sneddon <i>et al.</i> 2012 [2]
δ	Eq (S13)	-0.04	Equation Eq (S13)
H	Eq (S13)	4.9	Equation Eq (S13)
Parameters in Fig 1A heatmap			
Name	Definition	Value	References and Explanations
v_0	Maximal run speed	20 $\mu\text{m}/\text{s}$	Sneddon <i>et al.</i> 2012 [2]
r_0	$r(f = f_0)$	0.8	This study
t_M	Memory	10 s	Dufour <i>et al.</i> 2014 [3]
C_i	Initial concentration	0.1 mM	This study
D_R	Rotational diffusion (run)	0.00061 – 0.19 s ⁻¹	Let τ_{D0} vary from $10^{-1.5}$ to 10^1
D_T	Rotational diffusion (tumble)	0.023 – 7.1 s ⁻¹	Keep $D_T/D_R \approx 37$ [4, 5]
L	Gradient length scale	186 – 58800 μm	Let τ_E vary from $10^{-1.5}$ to 10^1
Parameters in Fig 1A scatter plot that are different from [6]			
Name	Definition	Value	References and Explanations
D_R	Rotational diffusion (run)	sampled from log-normal: mean 0.062 s ⁻¹ std 0.03 s ⁻¹	Account for variations in cell lengths [4, 7]
D_T	Rotational diffusion (tumble)	37 D_R	Keep $D_T/D_R \approx 37$ [4, 5]
L	Gradient length scale	1500 μm and 4800 μm	$1/\ \nabla \ln C\ $
Parameters in Fig 3			
Name	Definition	Value	Reference and Explanations
v_0	Maximal run speed	20 $\mu\text{m}/\text{s}$	Sneddon <i>et al.</i> 2012 [2]
r_0	$r(f = f_0)$	0.8	This study
L_i	Initial gradient length scale	1000 μm	This study
C_0	Exponential gradient source	10 mM	This study
L_0	Length scale of C_0 source	1000 μm	This study
C_1	Linear gradient source	1 mM	This study
a_1	Slope of C_1 source	0.0001 $\mu\text{M}/\mu\text{m}$	This study
C_2	Localized source	1 mM	This study
R_0	Size of C_2 source	100 μm	This study
t_M	Memory	0.54 – 17 s	Let initial τ_E vary from 3 to 0.1
D_R	Rotational diffusion (run)	0.0036 – 0.11 s ⁻¹	Keep $\tau_D = 1$ fixed
D_T	Rotational diffusion (tumble)	0.13 – 4.2 s ⁻¹	Keep $D_T/D_R \approx 37$ [4, 5]

References

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6. Waite AJ, Frankel NW, Dufour YS, Johnston JF, Long J, *et al.* Non-genetic diversity modulates population performance. *Mol Syst Biol.* 2016 Forthcoming.
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